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Comparative Outcomes of Traditional Versus High-Definition Liposuction in the Surgical Management of Gynecomastia: A Prospective Study

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ABSTRACT

The prevalence of male patients seeking surgical treatment for gynecomastia has increased in recent years. While traditional liposuction with or without gland excision remains a standard approach, high-definition (HD) liposuction has emerged as a technique that offers improved aesthetic outcomes through enhanced chest contouring. **Objectives:** To compare the early and late clinical outcomes of traditional liposuction versus high-definition liposuction in the surgical management of gynecomastia. **Methods:** This prospective, comparative study was conducted at Jinnah Burn Reconstruction Surgery Centre, Allama Iqbal Medical College, Lahore. Sixty patients aged 18–55 years were enrolled and divided into two groups: Group A (traditional liposuction) and Group B (high-definition liposuction). **Results:** In this study, the mean age of the cases was 25.33 ± 4.14 in Group A, while 26.63 ± 3.88 in Group B. The mean operation time was 86.33 ± 18.38 in Group A, while 52.60 ± 25.75 in Group B, with a statistically significant p=0.001. Patient satisfaction after 3 months (86.7% vs 96.7%, p-value=0.161) and 1 year (66.7% vs 93.3%, p-value<0.001) was higher in Group B. The comparison of seroma, infection, and asymmetry showed insignificant differences p-value > 0.005. **Conclusions:** High-definition liposuction appears to offer superior aesthetic results and greater patient satisfaction compared to traditional liposuction, without an increase in complications. It represents an effective alternative in the surgical management of gynecomastia.

INTRODUCTION

Gynecomastia refers to benign growth of glandular breast tissue in men, and occurs in about 30-70% of males during their lifetime [1]. Can be due to hormonal imbalance, systemic disease, physiological changes, or the use of some medications. Most commonly, it will present as a rubbery or solid mass that is symmetrical below the nipple [1, 2]. While pseudo-gynecomastia may have some impact on body image and psychological well-being, true gynecomastia can have a significant effect on the psychological health and body image of the patient, particularly in teens and young adults [2]. Treatment options may range from medicinal treatment and monitoring for early or moderate cases to surgical treatment for long-standing, symptomatic, and cosmetically troublesome cases [2, 3]. Over the years, various classification systems have been developed, such

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as Simon's grading, to guide treatment decisions based on the amount of glandular and fatty tissue and the degree of ptosis [3]. Typical surgical interventions are usually direct excision of the glands or liposuction. There have been advancements in cosmetic surgery to allow for more cosmetic surgery procedures, such as newer technologies like laser lipolysis, radiofrequency-assisted contouring, and ultrasound-assisted liposuction [4, 5]. However, one of them, high-definition (HD) liposuction, has emerged as a promising technique that can enhance the contour and give more athletic results by sculpting superficial and deep fat compartments to minimize the effect of the fat and increase the muscle beneath it [6, 7]. Another technique that could be employed is intramuscular or submuscular fat grafting to enhance areas that may be deficient [8].

Although more and more patients are seeking HD liposuction, there is a lack of comparative clinical studies that examine the results of this procedure versus those of traditional liposuction in patients with gynecomastia. Specifically, there is limited data on the duration of operation, volume of aspirated fat, complications, and patient satisfaction between these two methods. Moreover, most of the current literature consists of case series or descriptive reports lacking standardized outcome assessment. This study was therefore designed to prospectively compare early and late clinical outcomes of traditional versus high-definition liposuction in the surgical treatment of gynecomastia. By analyzing objective intraoperative metrics, postoperative complications, and long-term patient-reported satisfaction, we aim to provide evidence to guide the choice of technique for optimal aesthetic and functional results.

METHODS

This prospective, comparative study was conducted at Jinnah Burn Reconstruction Surgery Centre, Allama Iqbal Medical College, Lahore (6116/ED/JB&RSC, Date: 27 August 2024). This study was conducted from September 2024 to August 2025. A total of 60 male patients were enrolled in this study after taking informed written consent. The sample size of 60 patients (30 in each group) was calculated using the WHO sample size calculator by comparing two proportions, assuming an expected difference of 30% in patient satisfaction between the groups based on previous literature [7], with a confidence level of 95% and a study power of 80%. They were allocated into two groups: Group A underwent traditional liposuction, and Group B underwent high-definition (HD) liposuction. A simple random sampling technique was employed. Male patients between 18 and 55 years of age, diagnosed with gynecomastia, with a body mass index (BMI) of 35 kg/m^2 or less, and generally good health, were eligible for inclusion. Patients with a BMI greater than 35 kg/m^2 or those with a history of bariatric surgery were excluded from the study. The study protocol was approved by the Institutional Ethical Review Committee. Data were collected by using a structured proforma. All patients who were admitted to either of the participating hospitals were evaluated, and data were obtained. The objectives, methodology, cost sources, potential conflict of interest, institutional affiliations, potential benefits, risks, and post-study arrangements were presented to all participants in accordance with the Declaration of Helsinki. They were also reminded that they could leave at any time without penalty. All subjects were informed in writing about the permission. The number of days needed for the patient to resume their normal daily activities or occupational function was defined as the time of work. Traditional Liposuction Technique: The procedures were performed using general anesthesia, supine position, and arms spread to 90 degrees. After routine skin preparation and draping, a 4 mm stab incision was made in the anterior axillary fold. A tumescent solution was placed in the tumor and surrounding tissue using a blunt-tipped 4-mm Klein infiltration cannula. Following a 7-minute latency interval, a second incision was performed along the anterior axillary line along the inframammary fold. Liposuction was executed with a 3.5-mm blunt-tipped Coleman cannula with vibration-assisted liposuction (VAL) following established methods. Patients with remaining glandular tissue received immediate excision. Drains were inserted via the inferior port location, and compression dressings were administered postoperatively. High-Definition Liposuction Technique: Preoperative markings were performed with the patient in the standing position, outlining muscle borders and negative anatomical triangles (latissimus dorsi–pectoralis major region) where both superficial and deep liposuction were planned. Resection zones were demarcated, and areas of pectoralis muscle deficiency were identified for potential fat grafting. Following tumescent infiltration, VASER-assisted emulsification was performed for 3–5 minutes per side, after which liposuction and glandular excision were carried out. VASER is done at a low setting, and fat accumulation is done in a sterilized container. Fat was prepared by gravity and Sedimentation in 50 ML Syringes. Fat infiltration intramuscular and submuscular is done. Closed-suction drains were placed, and compression garments were applied. Drains were removed after 24 hours, patients were discharged, and dressings were changed on the 4th postoperative day. Then patients were followed up at 6th day, 15th day, 1 month, and 6th month.

Data were analyzed using SPSS version 23.0. Quantitative variables were expressed as mean ± standard deviation, while qualitative variables were presented as frequency and percentages. An independent sample t-test was

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applied to compare means between groups, and a chi-square test was used for categorical variables. A p-value of <0.005 was considered statistically significant.

RESULTS

In this study, the mean age of the cases was 25.33 ± 4.14 in Group A, while 26.63 ± 3.88 in Group B. The mean operation time was 86.33 ± 18.38 in Group A, while 52.60 ± 25.75 in Group B, with a statistically significant p<0.001. The mean amount of aspirated fat was 493.00 ± 32.60 ml in Group A and 450.67 ± 55.26 in Group B, with p<0.001. The comparison of hospital stays hours and time of work showed insignificant p-values, i.e., 0.386 and 0.650, respectively. Simon's grades of gynecomastia were found to be insignificant between the two groups (Table 1).

Table 1: Demographic and Operative Characteristics

Variables	Group A, Mean ± SD/ n (%)	Group B, Mean ± SD/ n (%)	p-value
Age	25.33 ± 4.14	26.63 ± 3.88	0.215
Operation Time (Minutes)	86.33 ± 18.38	52.60 ± 25.75	<0.001
Hospital Stay Hours	8.73 ± 2.05	9.20 ± 2.09	0.386
Amount of Aspirated Fat (ml)	493.00 ± 32.60	450.67 ± 55.26	<0.001
Weight of Excised Glandular Tissue Bilaterally (g)	165.33 ± 74.59	167.83 ± 72.25	0.896
Time of Work (days)	5.40 ± 2.43	5.70 ± 2.67	0.650
Grade			
I	17 (56.7%)	18 (60%)	0.598
IIa	9 (30%)	6 (20%)	
IIb	4 (13.3%)	6 (20%)	
III	0 (0%)	0 (0%)	

In this study, 14 (46.7%) patients in Group A and 8 (26.7%) patients in Group A received general anesthesia. Pseudo-gynecomastia was found in 5 (16.7%) patients in Group A and 3 (10%) in Group B. Patient satisfaction after 3 months (86.7% vs 96.7%, p 0.161). Patient satisfaction at 1 year (66.7% vs 93.3%, p=0.001) was higher in Group B with a statistically significant difference (Table 2).

Table 2: Anesthesia and Patient Satisfaction

Study Groups		Group A, n (%)	Group B, n (%)	p-value
Type of Anesthesia	General	14 (46.7%)	8 (26.7%)	0.108
	Local	16 (53.3%)	22 (73.3%)	
Pseudo-gynecomastia	Yes	5 (16.7%)	3 (10%)	0.448
	No	25 (83.3%)	27 (90%)	
Patient Satisfaction After 3 Months	Yes	26 (86.7%)	29 (96.7%)	0.161
	No	4 (13.3%)	1 (3.3%)	
Patient Satisfaction After 1 Year	Yes	20 (66.7%)	28 (93.3%)	0.001
	No	10 (33.3%)	2 (6.7%)	

The comparison of seroma, infection, and asymmetry showed insignificant differences p>0.005 (Table 3).

Table 3: Comparison of Early and Late Outcomes

Study Groups		Group A	Group B	p-value
Seroma	Yes	2 (6.7%)	1 (3.3%)	0.554
	No	28 (93.3%)	29 (96.7%)	
Infection	Yes	1 (3.3%)	1 (3.3%)	1.00
	No	29 (96.7%)	29 (96.7%)	
	No	30 (100%)	30 (100%)	
Asymmetry	Yes	1 (3.3%)	0 (0%)	0.313
	No	29 (96.7%)	30 (100%)	

Composite frontal and bilateral oblique views at six months following high-definition liposuction of the male chest, demonstrating stable pectoral contour, well-defined negative spaces, and sustained muscular delineation, were analyzed (Figure 1).

Figure 1: Composite Frontal and Bilateral Oblique Views at Six Months

Oblique view after high-definition chest sculpting showing refined transition zones between the pectoralis major, axillary fold, and upper abdomen with maintained surface definition (Figure 2).

Figure 2: Oblique View After High-Definition Chest Sculpting

Postoperative result following conventional chest liposuction illustrating volume reduction with comparatively smoother contours and limited muscular delineation (Figure 3).

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Figure 3: Postoperative Result Following Conventional Chest Liposuction

DISCUSSION

This study is a prospective comparative study that shows that high-definition (HD) liposuction offers better long-term patient satisfaction than traditional liposuction in the treatment of gynecomastia and has a similar safety profile. While there were no significant differences noted at 3 months, the aesthetic results of HD liposuction continued to improve over time at the 1-year visit, when edema subsided and final contouring stabilized. One of the important conclusions of this study is that the time for the operation of HD lipo is significantly shorter. This might seem paradoxical considering the extra contouring procedures, but the reasoning for this is that energy-assisted technologies like VASER enable emulsification of the fibrofatty tissue and help to get rid of fat more efficiently. This decreases the surgeon's workload and fatigue, and the length of the surgery. Previous studies using ultrasound- or power-assisted liposuction have reported similar results, with enhanced efficiency without affecting results. Adverse events such as seroma, infection, and asymmetry were rare and similar between groups, and the extra contouring involved with HD did not raise the risk of these complications [8, 9]. This is partly due to the fact that the technique is focused on removing fat selectively and sculpting the contours of the body, in lieu of debulking the fat in bulk, which could account for the slightly lower aspirated fat volume observed in the HD group. HD Liposuction is not just about fat removal like traditional liposuction; it is about strategically preserving and redirecting fat for an enhanced muscular definition. This focused technique could be the reason for the higher satisfaction level, even though the volumes of aspirated fat were lower; patient satisfaction is more dependent on the quality of the contour rather than the total amount of fat removed. The efficiency of energy- and power-assisted platforms (VASER and PAL), which emulsify fibrofatty tissue and facilitate extraction, is the plausible explanation for a shorter operative time in the HD group [10-13]. This increase in satisfaction with HD may be due to its ability to achieve selective fat definition in both superficial and deep fat compartments, as well as fat grafting in those where warranted, to improve the borders of the pectoral [7, 8]. These results are in accordance with previous studies that found liposuction alone is an effective treatment for lower-grade disease and a combination of treatments will enhance contour reliability in denser or higher grades of gynecomastia. Technique selection is based on classification- and algorithm-based strategies based on tissue character and ptosis [14, 15]. Importantly, there were low incidence rates of seroma, infection, and asymmetry in both groups. This discovery strengthens the safety of HD liposuction and suggests that both the extra sculpting maneuvers and fat grafting do not add to the risk of complications when done by an experienced surgeon. The findings confirm those of previous studies that report a low rate of complications with both traditional and innovative liposuction techniques. Comparative series and reviews report low complication rates across modalities, with technique-specific nuances; combined or energy-assisted techniques may allow the preservation of low modality complication rates and increase contour, particularly in difficult cases [11, 9]. For some patients, the minimally invasive and/or endoscopic approach can provide further options for scar concealment and cosmesis [16-18]. It is possible that the lack of significance in satisfaction level is due to sample size, subjective outcome evaluation, and surgeon expertise reducing intergroup variability. Results can also be affected by heterogeneity in the grade, tissue density, and skin quality. Though longer follow-up is warranted, prospective and multicenter studies with VASER, PAL, and hybrid energy techniques report excellent outcomes with low complication rates, and the use of standardized outcome measures and long-term evaluation is emphasized [19, 20]. To sum up, HD liposuction confers the aesthetic benefits and does not have any more complications than traditional liposuction, especially for the male chest area. The results are consistent with the safety and efficacy of HD as a technique for correcting gynecomastia, particularly for those wanting an athletic contour. Larger multicenter studies, with grade-stratified comparisons versus objective aesthetic metrics and longer follow-up to confirm these benefits and optimize patient selection criteria [18, 19].

There are several limitations to this study. First, the sample size was small, and thus may have limited power to detect differences in less common complications. Second, subjective measures, like patient satisfaction, may be subject to response bias if they are not standardized, validated scoring systems used. Third, the duration of follow-up (one year) might not be long enough to evaluate very long-term outcomes and recurrence. Furthermore, the study took place in two centers where there was the

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possibility of different surgical procedures and perioperative management. Lastly, non-probability sampling limits external validity. Larger, multicenter, randomized controlled trials with standardized outcome measures such as validated aesthetic scoring systems and objective photo analysis should be conducted in the future. More extended follow-up periods are required to evaluate the long-term effectiveness. Incorporating cost-effectiveness analysis and stratification by grade of gynecomastia would further enhance clinical decision-making and guideline development.

CONCLUSIONS

High-definition chest contouring shows an evident benefit in shaping, definition, and patient-reported satisfaction compared with standard liposuction, with comparable safety, and is therefore a valuable and reliable tool for the surgical treatment of gynecomastia.

Authors' Contribution

Conceptualization: MB, MAY
Methodology: MB, MAY, KK, BB
Formal analysis: FAK
Writing and Drafting: MB, KK, AR, JA
Review and Editing: MB, MAY, KK, FAK, AR, BB, JA

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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